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**Background:** Tumors involving the distal humerus are very rare. Prior to the 1970's, sarcomas of the bone and soft tissues of the distal portions of the upper extremity were preferably treated with amputation. In the past thirty years, advancements in technology and chemotherapy/radiation have allowed limb-sparing surgery for selected patients. Attempts at reconstruction have included arthroplasty, arthrodesis, and allograft reconstruction. Reports of early methods of reconstruction have demonstrated many post-operative complications and poor functional results. Most recently, prosthetic reconstruction of the distal humerus and elbow joint with a modular, segmental, tumor prosthesis including a semi constrained, hinged elbow joint has become a safe and reliable means of skeletal reconstruction following resection of a metastatic tumor or soft tissue/bone sarcoma.

**Questions/Purposes:** In this article we present a series of patients treated with a hinged semiconstrained modular distal humeral replacement for reconstruction following wide resection of tumors of the distal humerus. Emphasis is placed on an extensile approach with meticulous neurovascular dissection and muscle rotation flaps (flexorplasties) for soft tissue coverage and restoration of elbow flexion. The goal of this study is to describe our surgical technique and the associated functional outcomes and complication rates.

**Patients and Methods:** We retrospectively reviewed the charts of 9 patients treated for tumors of the distal humerus between 2002 and 2015. The diagnoses consisted of 3 primary sarcomas of bone or soft tissue, 5 metastatic, and 1 recurrent giant cell tumor. There were 4 male and 5 female patients ranging in age from 36 to 78 years old (average: 57 years old). Patients were followed for an average of 36 months (range: 3-84 mos). Three patients had a history of radiation treatment. The surgical approach for each patient was the same. All patients were followed for a minimum of 2 years or until death. The functional status was rated using the Musculoskeletal Tumor Score System (MSTS).

**Results:** Five of nine patients (56%) presented with a pathologic fracture or pathological fracture nonunion. Six of the nine (67%) patients died of their diseases at a mean of 17 months (range: 3-68 mos) after surgery. Three patients were alive and disease-free at a mean follow-up of 76 months (range: 70-84 months). The average MSTS score for the 9 patients was 81% (range: 63-97%). Seven patients were pain free and 2 patients had persistent mild pain at follow up. All patients had normal shoulder function and the ability to use their hand and elbow for activities of daily living. All patients achieved 10-120 degrees range of motion of the elbow by 8-16 weeks after surgery. Complications included one superficial wound infection and 2 bushing failures resulting in instability. The bushing failures were successfully addressed. There was one instance of entrapment of the median nerve at 11 months postoperatively that resolved after surgical release of scar tissue. There were no instances of deep infections or loosening requiring revisions.

**Conclusions:** Tumors involving the distal humerus can be safely and reliably resected and reconstructed with a modular semi-constrained prosthesis. The procedure is associated with good to excellent outcomes in the majority of patients. Emphasis should be placed on gentle and meticulous neurovascular dissection and appropriate soft tissue reconstruction to optimize functional results and minimize complications.